ANALYSIS

OF THE

COTTON PLANT AND SEED,

WITH

SUGGESTIONS AS TO MANURES, &C.

BY THOMAS J. SUMMER.

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INTRODUCTORY, &C.

THE natural history of the Cotton Plant,* and improvement in its culture, in the Cotton growing States, are interesting subjects. Originally the production of the tropics, it has, in our country, travelled far into the temperate region, and flourishes on a belt of several hundred miles wide; extending from Virginia, along the Sea-coast, to our Western limits on the Gulf of Mexico. Congeniality of climate, seasons and soils, has carried the cultivation of this Plant, which is not certainly ascertained to have been indiginous to the United States, much farther than it was at first expected it would ever be extended; and it has become the staple of all those parts not actually mountainous in the Southern States. Whilst its culture has most rapidly advanced and increased in every section, the Planters of the old Cotton growing States, from the exhaustion of their soils, and the lack of proper systems of Rotation and Manuring, have been thrown in the back ground, in the scale of profitable production, by their more favored rivals, the fortunate possessors of the virgin lands of the South-west. If this deficiency is ever to be remedied—if the fertility of those soils worn out in the oft repeated production of Cotton, is ever to be restored, and permanently improved, for the future culture of this crop, or for other systems

*German *Kattunwolle, Baumwolle;* Dutch, *Ketoen, Boomwol;* Danish, *Bomald;* Swedish, *Bomull;* Italian, *Cotone, Bombagia;* Spanish, *Algodon;* Portuguese, *Algodno, Algodeiro;* Russian, *Chlobts-chataza bumaga;* Polish, *Bawelna;* Georgian, *Bomba, Bamby;* Latin, *Gossypium;* Greek, *Bombyx Ylon;* Mongul, *Kobung;* Hindoo, *Ruhi;* Malay, *Kapas;* Indian, *Kora:* Chinese, *Cay-Haung. Hoa-Mien.* Skinner, the etymologist, says that Cotton is so called from its similtude to the down which adheres to the quince, *malis cydoniis*, which the Italians call *cotogni*, and *cotoqui* manifestly *a cydonis.*

Gossypium, or Cotton, a genus of the polyandria order, belonging to the monoadelphia class of plants; and in the natural method of ranking under the 37th order, Columniferæ.—*Encyclopædia Britannia, vol.* 8, *p.* 21.

of tillage, it must be done under a proper understanding of what constituents are to be restored to the soil, to supply the places of those of which it has been robbed. How far, a correct Analysis of the Cotton Plant and Seed, will enable the present generation of Planters, to remedy the lack of fertility in their impoverished soils, and enhance their future productiveness for this crop, it is difficult to determine; but it is no matter of speculation, to assert, that it is essentially necessary for the improvement of the soil for Cereal crops, that the past industrious despoiling of the natural elements, should furnish a guide for their restoration. The analytical investigations made by the Author, and for their correctness receiving the sanction of Professor Von Liebig, the most celebrated Chemist of the age, and given to the world in their present shape, are not intended as the basis of a new theory for the production of the Cotton Plant, but merely as suggestive of aids, and by returning to the soil what has been taken from it, bring about a restoration of fertility, which will render its cultivation profitable to Agriculturists in any other marketable crops. When, however, we reflect, that of the One Thousand Million of pounds of Cotton, produced in the world, upwards of Five Hundred and Fifty Millions of pounds are grown in the United States, we readily see that the importance of this crop—swelling to this enormous amount since 1784, when it was doubted at Liverpool, that so much as *eight bales* could be produced in this country—demands all those scientific aids by which other nations have fostered their staple agricultural productions, and thereby contributed to National prosperity. England by her Commercial enterprize, assumed the pinnacle of national rank. The Cotton Plant, its production and adaptation to human wants, by manufacturing skill, will give the blood to invigorate our national prosperity. What a picture of prosperity would be presented, if we manufactured in South Carolina, all the Cotton grown in the State, and had sufficient commercial capital and enterprize, to concentrate the exportation and exchange of the manufactured material at our Queen City Charleston? Added to this, how much more pleasant would be the prospect ahead, if the cultivation of this crop was so regulated, and carried out that it would fit the soil for the increased after-production of the grain crops—those crops so essential to the prosperity of the world.

ANALYSIS, &C.

ANALYSIS OF THE ASH OF THE COTTON PLANT.

Qualitative Analysis.—A part of the ash was taken and boiled with distilled water, then filtered, the filtrate acidulated with Nitric Acid, and then treated with Nitrate of Silver, (AgO, NO_5.) A white precipitate of Chloride of Silver, was formed, showing the presence of Chlorine.

On adding Muriatic Acid, to another part of the ash, an effervescence took place, showing the presence of Carbonic Acid.

Another part of the ash was taken and dissolved in Muriatic Acid, and evaporated to dryness; then moistened with Muriatic Acid, and digested with water—a residue consisting of Coal Sand and Silica, remained insoluble. The presence of Silicic Acid was proved, by boiling the residue with Potassa, (free of Silicic Acid,) and evaporating the filtrate in the presence of Muriatic Acid, to dryness, then moistening with Muriatic Acid, and dissolving in water, the Silicic Acid remained insoluble. A portion of the liquid freed from Sand, Coal, and Silicic Acid, was nearly neutralised with Ammonia, when, upon the addition of Acetate of Soda, a white precipitate of Phosphate of Iron was formed.

To a part of the liquid filtered from this precipitate, Ammonia was added, which formed a white precipitate, showing that all the Phosphoric Acid was not in combination with Iron.

To another part of the liquid filtered from the precipitate of Phosphate of Iron, Oxalate of Ammonia was added, which formed a white precipitate of Oxalate of Lime.

The liquid filtered from this precipitate, gave on the addition of Phosphate of Soda and Ammonia, a precipitate of Phosphate of Magnesia and Ammonia, showing the presence of Magnesia.

Another part of the liquid freed from Sand, Coal, and Silicic Acid, was boiled with an excess of Baryta water, and filtered. The excess of Barytes in the filtrate, was removed by Carbonate of Ammonia and Ammonia, and filtered—the filtrate was evaporated to dryness, and dissolved in a small quantity of water. A part of this solution was treated with Bi-Chloride of Platinum; a yellow Crystaline precipitate was formed, showing the presence of Potassa.

A part of the residue was tested with the blow-pipe for Soda; the presence of which was proved.

A portion of the liquid freed from Sand and Silica, was treated with Chloride of Barium; a white precipitate of Sulphate of Barytes was formed, showing the presence of Sulphuric Acid.

Quantitative Analysis.—6.181 grammes of the ash was digested with Muriatic Acid, and evaporated over a water bath to dryness. The residue was gently ignited, and moistened with Muriatic Acid, then let stand for half an hour, after which, it was digested with water, and filtered upon a weighed filter. The Coal, Sand, &c., remained upon the filter, and was washed out with boiling water, until, on evaporating a drop of the filtrate on a platina foil, no residue remained.

The filter was now dried, and all the Sand, Coal, &c., were carefully separated, (in order not to damage the filter,) after which, the substance which was on the filter was boiled with Potassa in a platina basin over a water bath for one hour; then filtered upon the same filter, washed out with distilled water, and dried at 212°, until it remained at a constant weight. After deducting the weight of the filter, there remained, 0.621 grammes of Sand and Coal.

The part soluble in Potassa, was mixed with Muriatic Acid, (HCl,) and evaporated over a water bath to dryness; then ignited, and moistened with Muriatic Acid, (HCl,) and dissolved in water, filtered and washed, then dried and burned. It weighed after burning, 0.403 grammes, Silicic Acid (SiO_2.)

The liquid filtered from the Sand and Silicic Acid, (measured in a graduated tube,) was found to contain 480 cubic Centimetres, which was divided into three equal parts of 160 cubic Centimetres each, = 2.060 grammes of the ash, for each 160 cubic Centimetres of the liquid.

These three parts will be termed, A, B and C.

In A, the Phosphate of Iron, Lime and Magnesia, were estimated.

In B, the Sulphuric Acid, and the entire quantity of Phosphoric Acid.

In C, the Alkalies.

A.

The liquid A, was nearly neutralised with Ammonia, then Acetate of Soda, and free Acetic Acid, were added. The precipitate was left standing for 24 hours, after which, it was filtered and washed out with boiling water, then dried and burned. It weighed 0.346 grammes, or, for the entire liquid, 1.038 grammes of $2Fe_2O_3 3PO_5$, or, 0.507 grammes of Fe_2O_3 (Oxide of Iron.)

The liquid filtered from the precipitate of Phosphate of Iron, was treated with Oxalate of Ammonia. The precipitate of Oxalate of Lime, was filtered, washed, dried and burned. It weighed after burning, 0.643 grammes of Carbonate of Lime, (CaO,CO_2,) or for the entire liquid, 1.929 grammes, (CaO, CO_2,) $=$ 1.092 grammes Lime, (CaO)

The liquid filtered from the Oxalate of Lime, was evaporated over a water bath, to a smaller volume, then Phosphate of Soda and Ammonia, were added, and the precipitate left standing for two days, after which, it was filtered, and washed out with water containing one-eighth of Ammonia, and burned until it was white. It gave 0.301 grammes of $2MgO, PO_5$, (Pyrophosphate of Magnesia,) or, for the entire liquid, 0.903 grammes $=$ 0.330 grammes MgO, (Magnesia.)

B.

The solution B, was precipitated while boiling with Chloride of Barium, and left standing on a sand bath for 24 hours, then filtered and washed with boiling water, dried, and burned. It gave 0.079 grammes Sulphate of Barytes, (BaO, SO_3,) or, for the entire liquid, 0.237 grammes, (BaO, SO_3,) $=$ 0.081 grammes Sulphuric Acid, (SO_3.)

The liquid filtered from the precipitate of BaO, SO_3, was mixed with per-chloride of Iron, and Acetate of Soda, and boiled for five minutes in a large flask; then the precipitate of Phosphate of Iron, and Basic Acetate of Iron, was filtered while warm,

and washed with boiling water, until on evaporating a drop of the filtrate, there remained no residue.

The precipitate was dissolved while moist, in as small a quantity of Muriatic Acid, as possible. Tartaric Acid and Ammonia, were now added in excess, when to the clear yellow coloured solution, a mixture of Sulphate of Magnesia and Chloride of Ammonia, was added, (to prevent a precipitate of Magnesia.) The precipitate was left standing for two days, after which, it was filtered and washed out with water containing Ammonia. When dried, burned and weighed, it gave 0.442 grammes of $2MgO, PO_5$, or, for the entire liquid, 1.326 grammes of $2MgO, PO_5 = 0.837$ grammes Phosphoric Acid, (PO_5.)

C.

Baryta water was added to this solution, until an Alkaline re-action had taken place, then boiled and filtered. The excess of Barytes in the filtrate, was removed with Carbonate of Ammonia and free Ammonia—the filtrate was evaporated over a water bath to dryness, and ignited until it was free from all Ammoniacal Salts, then dissolved in water. Some Magnesia remaining insoluble, was filtered off, and the filtrate again evaporated to dryness, and ignited, then weighed. It gave 0.770 grammes of the Chlorides of the Alkalies, which is for the entire liquid, 2.310 grammes. These Alkalies were again dissolved in a small quantity of water, and the Potassa estimated with Bi-Chloride of *Platinum*, which gave, after being evaporated with Alcohol over a water bath, 2.356 grammes of Double Chloride of Potassium, and Chloride of Platinum, ($KCl, PtCl_2$,) or, for the entire liquid, 7.068 grammes, ($KCl, PtCl_2$.) This represents 2.157 grammes, Chloride of Potassium, (KCl,) or, 1.326 grammes, Potassa, (KO.)

There remains, consequently, after substracting the Chloride of Potassium, from the Chlorides of the Alkalies, as follows, the amount of Chloride of Sodium, which is estimated as loss, thus, 2.310 $KCl, NaCl, - 2.157, KCl. = 0.153$ ($NaCl$,) Chloride of Sodium.

2.970 grammes of the ash, was boiled with distilied water, and filtered. The filtrate was acidulated with Nitric Acid, then precipitated with Nitrate of Silver. It gave 0.044 grammes Chloride of Silver, ($AgCl$,) or, 0.022 grammes Chlorine, (Cl.)

Also 0.153 grammes NaCl,—0.037 grammes, NaCl, = 0.116 grammes Chloride of Sodium, (NaCl,) = 0.061 grammes Soda, (NaO.)

1.066 grammes of the ash, gave 0.168 grammes Carbonic Acid, (CO_2.) The following is the Percentage of the constituents in 100 parts of the ash.

Grammes found.		Percentage.	
Silicic Acid,	0.403	6.50	SiO_2.
Sand and Coal,	0.621	10.04	Sand & Coal.
Oxide of Iron,	0.507	8.20	Fe_2O_3.
Oxide of Lime,	1.092	17.66	CaO.
Oxide of Magnesia,	0.330	5.33	MgO.
Sulphuric Acid,	0.081	1.31	SO_3.
Phosphoric Acid,	0.837	13.37	PO_5.
Potassa,	1.362	22.01	KO.
Soda,	0.061	0.99	NaO.
Chloride of Sodium,	0.037	0.05	NaCl.
Carbonic Acid,	0.168	15.72	CO_2.
		101.19	

ANALYSIS OF THE ASH OF COTTON SEED.

Preparation of the Ash.—The seed were burned in a Hessian Crucible, with a Muffle. Only a slight red heat, was necessary to burn them perfectly white.

For estimating the amount of water, 6.406 grammes of the seed were taken and dried, at 212°, until they remained at a constant weight. They gave 0.646 grammes water, = 10.08 *p.c.*—in 100 parts of *the seed.*

Estimation of the Ash.—The seed were dried until they remained at a constant weight, then burned in a Platina Crucible. 6.587 grammes of the dried seed, gave 0.237 grammes Ash—equal 3.8 per cent Ash, in 100 parts of the dried seed.

The qualitative analysis, showed, that all the constituents were present, which were in the Ash of the plant, with the exception of Carbonic Acid.

The quantitative analysis, was carried out similar to that of the Ash of the plant, heretofore described.

The following are the results—1.882 grammes of the Ash was used.

Found.		Per Cent.	
Phosphoric Acid,	0.667	35 43	PO_5.
Oxide of Iron,	0.075	3.43	Fe_2O_3.
Coal,	0.020	1.05	Coal.
Sulphuric Acid,	0.060	3.19	SO_3.
Oxide of Lime,	0.204	10 88	CaO.
Oxide of Magnesia,	0 200	10.61	MgO.
Potassa,	0.523	27.82	KO.
Soda,	0.051	2.75	NaO.
Silicic Acid,		Trace.	
Loss and Chlorine,		4.84	
		100.00	

SUGGESTIVE REMARKS.

On examining the foregoing Analysis of the Cotton Seed, we see that they abound in the Phosphates and Alkalies. Drs. WILL and FRESENIUS, in their Analysis of the Cereal grains, show that Wheat also abounds largely in these constituents.

In order to enable the reader to make the comparison, we give the Analysis of Red and White Wheat, as published by them. It is as follows:

	Red.	White.
Potass	20.80	30.17
Soda	15.01	......
Lime	1.83	2.76
Magnesia	9.12	12.08
Peroxide of Iron	1.29	0.28
Phosphoric Acid	46.91	43.89
Silica	0.15	......
Charcoal and Sand	4.89	9.03
	100.00	98.21

All these constituents being derived directly from the soil, plainly indicate the reasons, why our lands in the South are so easily exhausted. The crops extensively cultivated here, all require in a great measure, the same food from the soil, and hence soils which will not produce Cotton, are alike incapable of producing the Cereal crops. The great benefit derived from the application of Cotton Seed as a manure to these crops, is accounted for from the same causes; an abundance of Phosphates being given in their application to the soil.

FALLOWING.

A System of tillage, which carries away annually so large a proportion of these natural essentials to vegetation, and which provides no means of returning them, must necessarily impoverish any soil. A fixed principle in the Agriculture of all countries where the prosperity of the future has at all been regarded, has been, the gradual but certain improvement of the soil. This is necessary for the support of increased population, and in the Slave States, where there has been such an extraordinary and rapid increase of the laboring population, it should never be lost sight of. The intensity of our Southern sun-shine, prevents in a great measure, the annual coat of grass which supplies vegetable matter to the soil in Northern climates, and the never-ending occupation of the soils, by our system of culture, prevents the natural improvement which in other countries is carried out by Fallowing. We are well aware, that Fallowing is generally objected to in the South, and we think where Fallow is converted into pasture land, and taxed during the whole season for the production of herbage to sustain greedy herds, the system might well come into disrepute. Planters too, object to Fallowing, and say they have not land enough to allow one-half to lie idle, &c., but reason and justice to the noble occupation of Agriculture, allows this objection to pass unheeded; and its fallacy is proven by the desert wastes of "*Old Fields*," an agricultural feature only common to the New World, and we blush to say it, only visible to the Southern or Planting States. In Europe, where arable soil compared to population, is a thousand times scarcer than in the Southern States, the Agriculturists find Fallowing a remunerating system. It is but little understood in American Agriculture, and we may be pardoned for giving the proper details

for Fallowing, believing it to be the *cheapest* manner of renovating our soils. A field intended for Fallow, should be deeply ploughed in mid-winter—the deeper the ploughing, the better. This is simple preparation, but nevertheless, necessary; and above all things, keep every description of Stock off the field. The porousness of the Soil, will facilitate the assimilation of the natural Salts of the earth, and atmospheric action, with the dissolving influence of the rains, will generally bring to the aid of the succeeding crop, a sufficient quantity of these for its production. Late in Autumn the herbage should be turned under. This process exerts Chemical and natural influence beneficial to the Soil—First: as by decomposition of vegetable matter Carbonic Acid is produced, which is known to act as a powerful solvent of Phosphated Alkalies—Secondly: those portions of the grass and weeds, not readily decomposable, when admixed with the soil, gives it that friability so necessary to easy tillage, and thus aids the Agriculturist in his future labors. A *bastard* system of Fallowing, might, by the aid of the Black and Red Tory Pea, be judiciously adopted in the Cotton growing States. Owing to their imperviousness to wet, they can be sown in mid-winter, and vegetating in the Spring, without the aid of cultivation, generally make upon ordinarily productive land a sufficient crop to protect it from the sun in Summer, and smother out those weeds which are such a pest to cultivated crops. The constituents of the Indian Pea—known to be in a great measure derived from the atmosphere—would in all probability, furnish a better green crop for subversion, than the natural grasses and weeds. Judicious Fallowing, is therefore, in our opinion the cheapest, and by far the easiest mode of renovating and preserving the productiveness of our soils, and if adopted and regularly persevered in, would heighten both the production and value of our Cotton lands.

COMPOST MANURE.

Much may be effected in reclaiming worn out Cotton lands, by a good system of Compost Manuring; the benefits of which have been forced upon our Agriculturists by the gradual accumulation of animal manures, and the decomposition of wasted vegetable matter, in and around their barn-yards. It is a system which should be so generally understood and practised, that we

deem it unnecessary to make, other, than a few remarks respecting the increase of this manure and its application. It is a mistaken idea, that the Planter gains by hauling into his barn-yard, the stalks from his Corn and Cotton fields, in order to convert them into compost manure. Their elements would be returned to the soil, by the certain law of vegetable decomposition, if suffered to remain on the fields, and their place in the compost heap can be supplied easily, by litter and leaves from the forests, grasses, weeds, and muck from the marshes, ditches, and fence rows on the farm. Weeds, abounding in the alkalies, furnish profitable vegetable matter for composting. In addition to these, we have the rotten wood and forest leaves, which are so abundant on all hands. Muck or peat, being decayed vegetable matter in mass, in this concentrated form contains a large amount of Phosphates and Alkalies—and when mingled with the droppings of animals, forms a compost highly retentive of substances thus imparted, which it yields most readily to the growing crops to which it is applied. Compost when applied in winter, does not require to be thoroughly decomposed, but when, as is the case on crops where it is applied in the Spring, and its elements are demanded immediately by the young plants, its decomposition should be perfect. The compost heap should be protected from the rains, in order to prevent those salts rendered soluble by moisture, from being washed away. It would add much to the value of compost manure, if the water collecting on the roofs of farm buildings, was carried in gutters entirely beyond the yard, and not allowed to flow through it, which would be greatly facilitated by a concentration of farm buildings. Every domestic animal if properly confined and quartered, when not in use or grazing, would amply repay for the trouble in attending to them, and the filth from the wash house, stercorary, pig-pen, hen house, and pigeon cote, so much neglected amongst us, would if properly hoarded, furnish most valuable ingredients to the heap. A concentration of all that is essential to the production of our cultivated plants, being found in the component parts of this fertilizer—derivable from the Cereal food consumed by animals, and the Phosphate and Alkaline properties of the weeds, grasses, &c., makes it at once, the best and cheapest form of applying vegetable and animal manures for the immediate production of a crop, at the command of our Planters. The

quantity might be increased on every plantation in the State, to a degree which would make its manufacture profitable. This, however, will never be done until fewer acres are planted, which will enable them to manure more land.

BONE MANURE.

Bones, according to BERZILIUS, contain 55 *p. c.*, of the Phosphates of Lime and Magnesia. The relative value of the bones of different animals varies in their constituents, and also from the difference in age, their value being increased with years. The bones upon every farm, would furnish, if preserved and applied, a considerable amount of the best and most durable fertilizer, which is peculiarly adapted to the production of the Cotton crop. This is proven by the identity of the constituents which compose bones, and are found in the Cotton Plant. The Planter in the marl regions, especially where fossil bones and shells abound, has an abundant supply of native phosphate of lime, which only reqnires pulverization, to render it almost as useful as the recent bones. Phosphates in the bones comprise their chief value, which is shown by the fact, that they make a fertilizer equally as valuable, after the fatty mattter has been extracted by soap boilers, as before—hence, all old bones might be rendered valuable if properly applied. Guano, the most powerful fertilizer applicable to husbandry, being the ordure of sea-birds, it is known, derives its great value from the amount of bone earth it contains. We therefore regard the annual waste of bones on plantations in the South, where more animal food is consumed than by any other people in the world, as the most suicidal disregard of that economy, which has furnished the axiom to Agriculturists—"*that Manure is wealth.*" Many arguments abound, to favor the adoption of Bones as Manure amongst us. One is, they can easily be preserved, and it only requires the same labor to do this, that it does to throw them away. Another argument in their favor is, that a laborer in a sack, can transport to a distant field, bone manure which will furnish more constituents to the crop, than can be concentrated in a four horse load of the best stable dung, or compost manure—still another, is the little labor it requires to apply them to the soil. The great secret of applying bones to the soil, is found in pulverizing them into as finely seperated particles as possible,

which fits them for the operation of speedy atmospheric influence—in order that their constituents may be taken up rapidly by the plants. Grinding, crushing and burning, are the usual modes, but in order to fit the crushed bones or bone ashes, for the greatest production, Professor Von Liebig, recommends the following process. Pour over the crushed bones or bone ashes, half their weight of Sulphuric Acid, diluted with four parts of water, and after they have been digested for twenty-four hours, add one hundred parts of water—sprinkle this mixture over the field immediately before ploughing. By its action in a few seconds, the free acids uniting with the bases contained in the earth, a neutral salt is formed, in a very fine state of division. Experiments instituted on soils, for the purpose of ascertaining the action of manure prepared in this manner, have distinctly shown that neither grain, nor kitchen garden plants, suffer injurious effects in consequence, but that, on the contrary, they thrive with much more vigor after its application. (*Vide Von Liebig's Organic Chemistry, American Edition, p.* 230.)

Another theory of application, by the great French Chemist, M. Dumas, the substance of which we give from his article (contained in *Comptes Rendeus, Nov.* 30, 1846, *p.* 1018,) "*On the Manner in which Phosphate of Lime enters Organized Beings*," is interesting. He remarks, that the Phosphate of Lime being insoluble in water, nevertheless penetrates, and is deposited in their structure, and bones containing it are slowly disaggregated by the soil, and disappear after a time, under the influence of the rains. The investigations of M. Dumas discovered two causes producing these effects—the one acting rarely and feebly—the other constantly, and with great intensity.

The first resides in a property possessed by Sal-ammoniac, which facilitates the solution of Phosphahate of Lime. Though this salt dissolves a noteable quantity, and exists in all running waters—yet, this slight proportion renders its action in this respect, inconsiderable.

The second is found in the action of Carbonic Acid; and in this, the true solvent of Phosphate of Lime, is to be found—for water impregnated with Carbonic Acid dissolves large quantities of Phosphate of Lime. M. M. Berzilius and Thenard, had remarked the alkalies and ebbulition, by driving off, or neutralizing the Carbonic Acid, which precipitated it.

M. Dumas, believing the action of Carbonic Acid to be such as above stated, did not doubt the efiect it would produce on the bones themselves. He therefore introduced plates of ivory into bottles of Seltzer water, (which contains a great deal of Carbonic Acid,) and they were as much softened in twenty-four hours, as if acted on by dilute Hydro-Chloric Acid, which is also a powerful solvent of Phosphate of Lime. The Seltzer water was found loaded with Phosphate of Lime, and the experiment proved the action of Carbonic Acid as its solvent, to be both rapid and certain. I am sure this discovery will be of importance to the Agricultural world.

I would call the attention of physiologists to this property in Carbonic Acid, as it satisfactorily explains, the transformation of the Phosphate of Lime into plants. Of course, it would not be practicable to dissolve the Phosphate of Lime, by the aid of Seltzer water, but the preparation of bone ashes by its known and powerful constituent, might be rendered available in the following manner. Where bone powder or ashes, is intended for manuring soil destitute of vegetable matter, let them be mixed with leaves or other organic matter, and its decomposition with the aid of the rains and atmospherical influence, will create a sufficient quantity of Carbonic Acid to assimulate the Phosphates in such a form, that they will be readily taken up by the organism of the plants.

How easily could a Planter manure a few acres of Cotton with bone powder or ashes? When all the bones are hoarded as gold, and their true value known, they will be appreciated. Then a bone mill for crushing, and simple apparatus for their chemical reduction, will be as essential to producing the crop, as a grinding mill is, to prepare grain for the food of man.

WOOD ASHES,

Containing Phosphates and Alkalies, to a considerable extent, where they abound, may be used advantageously as a manure for Cotton.

LIME,

Being useful in decomposing and ameliorating adhesive soils, might be profitably employed in the permanent improvement of Cottonlands.

Common Potter's Clay, diffused through water and added to milk of Lime, thickens immediately upon mixing, and if the mixture be kept for some months, and an acid be added, the clay becomes gelatinous, which is the effect of the admixture of the Lime. The Lime in combining with the elements of the clay liquefies it, and what is more remarkable, liberates the greater portion of its alkalies. These interesting facts, so important to the scientific world, were first observed by M. Fuchs, at Munich, and led to the explanation of the effects of Caustic Lime upon the soil, which furnishes the Agriculturist with an invaluable means of opening it, and setting free its alkalies—substances so indispensable to the production of his crops. (For further facts concerning Lime, and its application to Agriculture, see Liebig's Organic Chemistry, which should be in the hands of every one.) The Lime lands of the West producing abundant crops of Cotton, so long as furnished with vegetable matter, shows that Lime alone, upon exhausted soils would prove a doubtful aid.

We could add, suggestion after suggestion, relative to the aids to be applied to the production of Cotton, upon exhausted soils, but these being the most important, we shall dispense with the boundless materials which lie abundantly around us, and only need transporting to our fields in order to benefit them. It was a matter of surprise to Professor Von Liebig, that any soil not furnished by artificial means with the preponderating constituents of the Cotton Plant and Cotton Seed, should produce a crop abounding in the Phosphates. This leads me to further investigations, and a rich field of research still lies unexplored, in the analytical examination of the Cotton Soils of the South and West.

THE END.

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